

NON-PUBLIC?: N  
ACCESSION #: 8811160164  
LICENSEE EVENT REPORT (LER)

FACILITY NAME: Indian Point, Unit 3 PAGE: 1 OF 10

DOCKET NUMBER: 05000286

TITLE: Unit Trip Initiated By Loss of Auto Stop Oil Pressure in Main Turbine  
Generator

EVENT DATE: 10/09/88 LER #: 88-006-00 REPORT DATE: 11/07/88

OPERATING MODE: N POWER LEVEL: 100

THIS REPORT IS SUBMITTED PURSUANT TO THE REQUIREMENTS OF 10 CFR  
SECTION  
50.73(a)(2)(iv)

LICENSEE CONTACT FOR THIS LER:

NAME: Edward Diamond, Senior Plant Engineer I TELEPHONE: (914) 736-8045

COMPONENT FAILURE DESCRIPTION:

CAUSE: B SYSTEM: TA COMPONENT: TG MANUFACTURER: W120  
B SB PCV I208  
X IG DET W120  
X AA FAN W120

REPORTABLE TO NPRDS: N

Y

Y

N

SUPPLEMENTAL REPORT EXPECTED: NO

ABSTRACT:

On October 9, 1988, with the reactor at 100 percent power, a unit trip was initiated by loss of auto stop oil in the main turbine generator. Plant systems functioned properly following the trip with the following exceptions: three condenser steam dump valves failed to fully close; the main turbine generator air pilot valve stuck in an intermediate position; the 480 volt bus 5A undervoltage protection circuit malfunctioned, resulting in a "non-SI blackout" actuation for the bus; the source range nuclear instrumentation N-32 did not automatically reenergize; control rod drive mechanism fans 31 and 33 could not be restarted after bus 5A was reenergized; and the condensate polisher facility bypass valve did not open. It was determined that the main turbine generator trip had resulted from shifting of the governor impeller assembly due to a

sheared retaining pin. Following repairs to the above listed equipment, the reactor was brought critical and synchronized to the bus on October 15, 1988. Full reactor power was reached on October 17, 1988.

END OF ABSTRACT

TEXT PAGE 2 OF 10

#### DESCRIPTION OF THE EVENT

At 1852 hours on October 9, 1988, with the plant at 100 percent power, the Westinghouse (W120) main turbine generator (MTG) (TA) (TG) tripped due to low auto stop oil pressure. The turbine trip initiated a reactor trip. Low-low steam generator water level following the trip initiated an auto-start of the three auxiliary feedwater pumps. All plant systems functioned properly following the unit trip with the following exceptions:

##### Steam Dump Valves Fail to Close

While carrying out post trip supplementary actions, control room operators observed that three Hammel-Dahl (I208) condenser steam dump valves (SB) (PCV) (Model V501) had failed to fully close. The valves had not closed as required when the reactor coolant system (RCS) temperature had decreased below 547 degrees F, no load average temperature. Operators were dispatched to isolate the valves in the field terminating the cooldown at 525 degrees F.

##### Inadvertent Opening of Breaker 52/5A

At 1853 hours, the control room experienced a loss of normal lighting, It was observed that the 480 volt bus 5A undervoltage protection circuit had erroneously sensed an undervoltage condition which opened the normal bus supply breaker and started and tied, in the associated 33 emergency diesel generator (EDG).

##### Source Range Detector Fails to Reenergize

At 1905 hours, the Westinghouse (W120) source range nuclear instrumentation N-32 detector (IG) (DET) (Model 6051D50G01) did not automatically reenergize. The Instrumentation and Controls (I&C) Contingency Watch was directed to investigate the problem. Source range nuclear instrumentation N-32 was returned to service at 2055. Source range nuclear instrumentation N-31 energized properly and was available throughout this event, providing the necessary core monitoring capability.

TEXT PAGE 3 OF 10

## Main Turbine Generator Oil-Operated Air Pilot Valve Stuck

The MTG Oil-operated air pilot valve (TF) (VTV) which vents instrument air (IA) from the MTG auxiliary valves stuck in an intermediate position venting the Turbine Hall IA header. The shift supervisor manually isolated instrument air to the MTG air pilot valve terminating the Turbine Hall IA blowdown.

## Failure of 31 and 33 Control Rod Drive Mechanism Line Fuses

At 1915, difficulty was encountered in restarting the Westinghouse (W120) control rod drive mechanism (CRDM) cooling fans (AA) (FAN) (Model L-1036) 31 and 33 after the loss of bus 5A. The fans blew their associated line fuses when restart was attempted. 32 and 34 CRDM . cooling fans were restarted without trouble. A containment entry was made, the line fuses for 31 and 33 CRDM cooling fans replaced, and CRDM cooling fans 31 and 33 were successfully restarted at 0042 on 10/10/88.

## Condensate Polisher Bypass Valve Fails to Open

The Cameron Iron Works, Inc. (CO60) condensate polisher facility (CPF) bypass valve (SF) (V) (Model 505291 21 01 08) did not open on the unit trip as it should have. After repeated attempts, the valve opened. The valve was repeatedly stroked, but responded sluggishly.

## INVESTIGATION OF THE EVENT

The trip of the main turbine generator was initiated by a loss of auto stop oil pressure resulting from the shifting of the governor impeller assembly (see attached schematic). This had occurred due to the fatigue failure of a retaining pin that restrains the governor impeller shaft in proper alignment with the MTG main oil pump.

## TEXT PAGE 4 OF 10

The locking pin failure allowed the governor impeller shaft assembly to be displaced approximately three quarters of an inch, which in turn moved and actuated the overspeed trip mechanism lever. This allowed a mechanical drain valve to bleed-off the auto stop oil pressure.

The following is a discussion of events secondary to the trip of the MTG but relevant to the event as a whole:

## Failure of Steam Dump Valves to Close

The failure of the three condenser steam dump valves to fully close was due to mechanical binding. The valves not closing caused a cooldown of the primary system to 525 degrees F. The reactivity added by this cooldown did not affect the shutdown state of the reactor. The cooldown was terminated when the valves were locally, manually isolated.

#### Main Turbine Generator Pilot Valve Failure

The MTG air pilot valve had failed in an open position, providing a vent path to atmosphere for the Turbine Hall IA system. The failure has been attributed to a buildup of foreign material on the internals of the valve.

#### Breaker 52/5A Inadvertent Opening

Loose fuse clips on the 480 volt bus 52/5A "c" phase potential transformer (PT) (EC) (FUB) within the westinghouse (W12O) 480 volt switchgear caused a spurious, intermittent undervoltage condition to be sensed, resulting in opening of the normal bus supply breaker and starting the tie-in of the associated 33 EDG. The loose PT fuse clips resulted in an erroneous undervoltage condition being sensed by the engineered safeguards logic and resulted in a "non-SI blackout" actuation for the bus.

TEXT PAGE 5 OF 10

#### Source Range Detector Failure to Reenergize

The source range nuclear instrumentation N-32's "crowbar" circuit, provided to protect the channel's detector from an overvoltage condition, actuated and terminated automatic reenergization. The source range was reenergized through operator action.

#### Control Rod Drive Mechanism Cooling Fans to Restart

Upon attempting to restart the CRDM fans after the loss of bus 5A, the fuses for 31 and 33 CRDM fans blew. CRDM fans 32 and 34 running caused backflow through CRDM fans 31 and 33 resulting in 31 and 33 CRDM fans rotating backwards. Attempting to restart 31 and 33 with their motors turning in reverse caused the associated fuses for these two fans to blow. Backflow dampers installed to prevent reverse rotation of the CRDM fans failed to operate properly.

#### CPF Bypass Valve Fails to Open

The CPF bypass valve did not open on the unit trip and responded sluggishly due to lack of lubrication. Discussions to resolve this problem are presently being undertaken with the manufacturer.

## CAUSES OF THE EVENT

The following root causes were determined from the investigation of the event:

### Trip of the Main Turbine

The failure of the retaining pin that restricts movement of the governor impeller assembly led to the displacement of the governor impeller assembly, which actuated the overspeed trip mechanism lever.

### Failure of the Steam Dump Valves

The cause of the mechanical binding of these valves is presently under investigation.

## TEXT PAGE 6 OF 10

### Breaker 52/5A

The cause of the inadvertent operation of the 52/5A breaker was directly related to the loose PT fuse clips. The fuse clips were loose due to relaxation of the brass fuse retainers.

### Main Turbine Generator Air Pilot Valve

The MTG air pilot valve had failed in an intermediate position due to foreign material buildup on the internals of the valve.

### Source Range Detector

The source range nuclear instrumentation N-32's "crowbar circuit" saw an overvoltage condition due to in-rush current upon reenergizing the instrument. This was quickly identified by I&C personnel.

### Control Rod Drive Mechanism Fans

The 31 and 33 CRDM fans blew their line fuses as a result of a failure of the backflow dampers to prevent reverse rotation of the non-operating fans upon restart.

### CPF Bypass Valve

The CPF bypass valve did not open on the unit trip due to lack of lubrication. Experience with the lubrication needs of the valve indicates

that the lubrication frequency is proportional to the number of valve cycles and is not strictly time dependent.

#### CORRECTIVE ACTIONS:

The following actions were undertaken as a result of this incident:

1) The MTG governor was refurbished with a new impeller, sleeve, and stub shaft. As recommended by Westinghouse the governor impeller was torqued to 1,000 foot-pounds instead of the nominal 500 foot-pounds. Proper performance of the governor was operationally verified.

TEXT PAGE 7 OF 10

2) The MTG overspeed trip mechanism was reassembled, adjusted, and tested.

3) The retaining pin for the governor impeller assembly was modified to provide additional strength needed for the application.

4) The condenser steam dump valves were tested under cold and hot conditions, with a technical representative from the vendor, Hammel-Dahl, observing the cold tests. Test results are currently under evaluation. Resolution of this problem is expected during the cycle 6/7 refueling outage.

5) The MTG pilot valve was replaced with a new valve. A requirement will be placed in the PM procedure for the MTG control oil system to inspect this valve.

6) Preventative maintenance was performed on the normal supply breaker to 480 V bus 5A, and the PT fuse clips on all the 480 V busses were modified with the installation of "clip clamps" to ensure positive fuse retention.

7) The CPF bypass valve was lubricated, and the Maintenance Department is developing a Pm program with the support of the vendor, Cameron Iron Works, Inc.

8) An engineering review will be undertaken to evaluate the design of the CRDM Fans in regards to their ability to start against reverse rotation.

#### ANALYSIS OF THE EVENT

This event is reportable under 10CFR50.73 (a) (2) (iv) . An evaluation has determined that this event has been considered under the guidelines of the plant FSAR and Technical specifications and no other safety concerns exist as a result of this event.

TEXT PAGE 8 OF 10

- 1) A turbine trip is an analyzed accident in Chapter 14 of the FSAR.
- 2) The intermittent contact of the 480 volt bus 5A "C" phase PT fuse may have prevented the loading of safeguards equipment on that bus, had they been needed. This would be equivalent to a safeguards actuation coincident with a loss of offsite power in which an EDG fails, which is an analyzed event in the FSAR and Technical specifications. Since both offsite power sources and the other two EDGs were operable throughout this event, there was no significant, adverse impact on plant safety.
- 3) Loose PT fuse clips represent a potential failure mechanism that could impact all 480 volt busses. The modification with installation of "clip clamps on each of the 480 volt bus primary PT fuse clips has eliminated the problem.
- 4) As per Technical Specification 3.5.6, one source range channel is required operable for reactor start-up. During this event, source range N-31 was energized and available.
- 5) RCS cooldown due to the partially stuck open condenser steam dump valves did not exceed the Technical Specification 3.1.A.1 limit of-100 degrees F per hour. Average temperature decreased from 567 degrees F before the trip to 525 degrees F when the condenser steam dump valves were isolated. The resultant cooldown did not jeopardize the shutdown state of the reactor.
- 6) Operability of the condenser steam dumps is not required by Technical Specifications or FSAR safety analysis.
- 7) The CRDM Fans, Condensate Polisher Facility, Turbine Hall Instrument Air, and the mechanical portions of the turbine hydraulic control system are not addressed by the FSAR or Technical Specifications.

TEXT PAGE 9 OF 10

#### SECURING FROM THE EVENT

On October 15, 1988, following completion of maintenance on the MTG and corrective action associated with this event, the reactor was brought critical at 0355 hours. The generator was synchronized to the bus on October 15, 1988 at 1216 hours, and full power was reached on October 17, 1988 at 0900 hours. No similar events or LERs have occurred or been reported to date.

TEXT PAGE 10 OF 10

COMPONENT FAILURE CONTINUATION

CAUSE: X SYSTEM: TF COMPONENT: VTV MANUFACTURER: W120  
B SF V C060  
B EC FUB W120

REPORTABLE TO NPRDS: N  
N  
Y

ATTACHMENT 1 TO ANO 8811160164 PAGE 1 OF 1

FIGURE OMITTED - NOT KEYABLE (DRAWING)

ATTACHMENT 2 TO ANO 881160164 PAGE 1 OF 1

Indian Point 3  
Nuclear Power Plant  
P .O. Box 215  
Buchanan, New York 10511

914-736-8000

New York Power Authority

November 7, 1988  
IP3-88-066  
IP3-88-006

Docket No. 50-286  
License No. DPR-64

Document Control Desk  
Main Station PI-137  
U.S. Nuclear Regulatory Commission  
Washington, D.C. 20555

Dear sir:

The attached Licensee Event Report LER 88-006-00 is hereby submitted in accordance with the requirements of 10CFR50.73. This event is of the type defined in Paragraph 50.73 (a) (2) (iv) .

Very truly yours,



W. A. Josiger  
William A. Josiger  
Resident Manager  
Indian Point Three  
Nuclear Power Plant

Attachment

cc: Mr. William Russell  
Regional Administrator  
Region 1  
U.S. Nuclear Regulatory Commission  
475 Allendale Road King of Prussia, Pennsylvania 19406

INPO Records Center  
Suite 1500  
1100 Circle 75 Parkway  
Atlanta, Georgia 30339

\*\*\* END OF DOCUMENT \*\*\*

---